excess of caustic potash, passing carbonic acid gas through the solution to saturation, and concentrating the solution: evernesiate of potash crystallizes out. From this the acid may be separated by means of muriatic acid. It gives a yellow colour with hypochlorite of lime.

Formula of hydrated acid........ $C_{18} H_9 O_7 + HO$
Formula of evernesiate of baryta.. $C_{18} H_9 O_7 + BaO + Aq.$
Formula of evernesiate of silver .. $C_{18} H_9 O_7 + AgO.$

Orcin.

This substance is always obtained when any of the colouring principles of the lichens which yield red dyes with ammonia are subjected to particular processes. The best way of obtaining it pure is to boil the alpha-, or beta-orsellesic acid, or the erythrelesic acid in water for about an hour. Carbonic acid is given off, and crystals of colourless orcin are deposited. It gives a dark purple red colour with hypochlorite of lime, quickly changing into deep yellow.

Empirical formula........ $C_{16} H_{11} O_7$.

Brom-orceide, $C_{16} H_{24} Br O_{13}$ (empirical), is obtained by pouring bromine into a concentrated aqueous solution of orcin; when pure it forms long white adhering needles; it has no taste or smell.

Chlor-orceide, a similar compound, is obtained by passing chlorine gas through a solution of orcin.

Usnic Acid.

This principle is found in *Usnea florida, U. hirta, U. plicata, U. barbata, Ramalinea calicaris, R. Fraxinia, Evernia Prunastri,* and *Cladonia Rangeferina.* It is best obtained from *Cladonia Rangeferina* and *Usnea florida,* by the use of lime and muriatic acid.

Its empirical formula is $C_{38} H_{17} O_{14}$.

February 17, 1848.

GEORGE RENNIE, Esq., Treasurer, in the Chair.

"On a Formula for the Elastic Force of Vapour at different Temperatures." By Captain Shortrede. Communicated by Lieut.-Col. Sykes, F.R.S.

The author adopts as the basis of his formula the first series of experiments at high temperatures made by the French Academy, and those of Magnus at low temperatures. For the Academy's experiments, he adopts the indications of the smaller thermometer in the steam in preference to those of the larger thermometer in the water. Of Dr. Young's sort of formulæ, he notices that of the Academy and several others with exponents varying from 5 to 7. From the elasticity at freezing, as given by Magnus, compared with four of the Academy's experiments, he shows that for the range of observation the number 6 is preferable to 5 as an exponent; but, as he states, no formula of this sort with a constant index can be found to agree with the observations throughout.

The formula of Magnus he finds to agree with these observations better than any of the others; but being adapted to the air-thermometer, and therefore not convenient for ordinary use, he gives his own formula adapted to the mercurial thermometer,

$$t = \frac{500 + 225 \log A}{5 - \log A},$$

t being the temp. Cent., and A the elasticity in atmospheres of $0^{m}\cdot76$ at zero, or 30 inches at 58° Fahr.; ∴ the temperature being given, the formula becomes

$$\log A = 5 - \frac{1625}{225 + t}.$$

The author compares with the experiments the formula of the Academy and those of Southern, Coriolis, Tredgold, and one deduced as above; also that given by August, and the same modified so as to give at freezing the elasticity found by Magnus; also that of Magnus, and the same reduced to the mercurial thermometer by the data of Dulong and Petit; and lastly, his own formula. Then assuming that the experiments of Magnus are represented by his formula, he compares the other formula with it at every 10° from −10° to 100° Cent. He shows that for the range of their experiments the Academy's formula is better than the others of Dr. Young's sort; but at low temperatures it is very erroneous. Southern's formula at low temperatures is better than that of Coriolis, but at high temperatures not so good. Tredgold and the other like it are better at low temperatures than that of Coriolis, but worse at high temperatures. August's formula is very erroneous; and in its modified form it is still worse, the errors increasing to about 10° or more, showing that the theoretic considerations by which it is deduced are not founded in truth. With the Academy's experiments, the errors of Magnus's formula are −, but when reduced to the mercurial thermometer they are all +, the mean of the whole being $0°\cdot33$. With the new formula the errors are nearly balanced, the sums on the thirty experiments being $-1°\cdot78$ and $+3°\cdot55$, in only two cases amounting to half a degree. On the twelve experiments, at or near the maximum, the errors are $-1°\cdot12$ and $+0°\cdot43$.

From zero to 100° the differences between the new formula and that of Magnus are all of one kind; and when reduced to temperature are less than $0°\cdot4$, which the author thinks to be within the probable difference between the air and mercurial thermometers, and within the errors of observation.

He then gives a table of temperature corresponding to elasticity of vapour in atmospheres. Also modifying his formula,

$$\log f\, 6\cdot47712125 - \frac{2925}{373 + t},$$

to give $f=$ the elasticity in inches of mercury for temp. Fahr., he gives a table of f for every degree from $-40°$ to $+360°$, by the help of which he compares with his formula, the experiments of Robison, Southern, Dalton, Taylor, Arsberger, Ure, and those of the American Committee, and shows that they differ more widely from each other than from the formula.

Considering the care bestowed to ensure the elasticities being correctly measured, the author is disposed to attribute a great part, but not the whole, of the discordance on the several results to errors in the measures of temperature arising from smallness of scale or incorrectness of division.

February 24, 1848.

GEORGE RENNIE, Esq., Treasurer, in the Chair,

"On the Moist-Bulb Problem." By Captain Shortrede. Communicated by Lieut.-Colonel W. H. Sykes, F.R.S.

The author adopts the notation of Professor Apjohn, and by a similar method deduces the fundamental equation, which is then translated into numbers, taking 1175° F. as the sum of the latent and sensible heats, 0·267 as the specific heat of dry air, the weight of aqueous vapour as five-eighths of that of air, and its specific heat $=0·867$, that of water being unity.

The coefficient for barometric pressure is resolved into a simple change on the temperature of the air, and consequently also on the depression of the moist bulb; and the equation is put into a shape convenient for use, and shown to be free from objection. The author uses the table of the force of vapour, given in the accompanying preceding paper, and then gives a table of maximum depressions for every degree of the moist bulb from $-40°$ to 212°, and another table interpolated from it for every degree of temperature of the air from 0° to 212°.

Gay-Lussac's depressions are then compared with those of the new formula; and the errors are shown to be almost insensible near the freezing-point, but increasing gradually, till at 25 Cent. it is about 10 per cent. The author attributes these errors to the gradual deterioration of the chloride of lime during the experiments.

The author then compares Prinsep's maximum depressions collected and given in vol. v. of the Journal of the Asiatic Society of Bengal. The observed depressions are generally below those given by the new formula, like those of Gay-Lussac. The errors on those where the air was heated by a steam-pipe, are not greater than on those at natural temperatures; and that with air passing through a porcelain tube at an orange heat, falls within the limits assigned by Prinsep in estimating the temperature of the air.

Apjohn's maximum depressions are then compared with the new formula. And here the errors are of an opposite character to those preceding, which the author attributes to the lowering of tempera-